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WHAT IS CLAIMED IS:

1		1. A plasma processing apparatus comprising:
2		a single carrier source adapted to generate a first RF signal at a carrier
3	frequency;	
4		a modulation source adapted to generate a second RF signal at a
5	modulation fre	equency;
6		a modulator adapted to modulate the first RF signal with the second RF
7	signal to form	an amplitude modulated signal, wherein the amplitude modulated signal
8	contains peaks	with amplitudes greater than or less than amplitudes of the peaks of the
9	first RF signal	; and
10		a plasma processing chamber coupled to the modulator.
1		2. The apparatus of claim 1 further comprising:
2		a power amplifier adapted to amplify the amplitude modulated signal from
3	the modulator	to generate a high power amplitude modulated signal.
1		3. The apparatus of claim \ further comprising:
2		a transmission line for transmitting the amplitude modulated signal; and
3		a single impedance matching network, wherein the single matching
4	network is ada	apted to receive the amplitude modulated signal and provides impedance
5	matching fron	n the transmission line to the plasma.
1		4. The apparatus of claim 1 wherein the modulation source is further
2	adapted to ger	nerate a third frequency modulating RF signal, and the modulator is further
3	adapted to mo	dulate the first RF signal with the second RF signal and the third RF signal
4	to form an am	plitude and frequency modulated signal.
1		5. The apparatus of claim 1 wherein the second RF signal is in the
2	form of a sine	wave.
1		6. The apparatus of claim 1 wherein the apparatus is an etching
2	apparatus.	
1		7. A plasma processing apparatus comprising:
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2	a carrier source adapted to generate a first RF signal at a carrier frequency;
3	a modulation source adapted to generate a second RF signal at a
4	modulation frequency;
5	a modulator adapted to modulate the first RF signal with the second RF
8 8	signal to form a frequency modulated signal; and
7	a plasma processing chamber coupled to the modulator.
1	8. The apparatus of claim 7 further comprising:
2	an amplifier adapted to amplify the frequency modulated signal to generate
3	a high power frequency modulated signal.
1	9. The apparatus of claim 7 further comprising:
2	a transmission line for transmitting the frequency modulated signal; and
3	a single matching network adapted to receive the frequency modulated
4	signal to provide impedance matching from the transmission line to a plasma.
1	10. The apparatus of claim 7 wherein the modulation source is further
2	adapted to generate a third RF signal at an amplitude modulation frequency, and wherein
3	the modulator is further adapted to modulate the first RF signal with the second RF signal
4	and the third RF signal to form an frequency and amplitude modulated signal.
1	11. The apparatus of claim 7 wherein the second RF signal is in the
2	form of a sine wave.
1	12. The apparatus of claim 7 wherein the apparatus is an etching
2	apparatus.
1	13. The apparatus of claim 7 wherein the modulation frequency is less
2	than about 0.1 times the carrier frequency.
1	14. A method of delivering power to a plasma processing chamber, the
2	method comprising:
3	generating a first RF signal at a carrier frequency;
4	generating a second RF signal at a modulating frequency;
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5	forming an amplitude modulated signal by modulating the first RF signal
6	with the second RF signal, wherein the amplitude modulated signal contains peaks with
7	amplitudes greater than or less than amplitudes of peaks of the first RF signal; and
8	delivering only the amplitude modulated signal to a reactant gas within the
9	plasma processing chamber to form a plasma.
1	15. The method of claim 14 further comprising, prior to generating the
2	15. The method of claim 14 further comprising, prior to generating the plasma:
3	amplifying the amplitude modulated signal to form a high power
4	amplitude modulated power signal, and wherein
5	delivering plasma within the plasma processing chamber using the
6	amplitude modulated signal comprises using the high power amplitude modulated signal
7	to generate the plasma.
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1	16. The method of claim 14 wherein the second RF signal has a lower
2	frequency than the first RF signal.
1	17. The method of claim 14 wherein forming an amplitude modulated
2	signal comprises:
3	forming an amplitude and frequency modulated RF signal with the second
4	RF signal and a third frequency modulating RF signal.
1	18. The method of claim \4 further comprising:
2	modifying the amplitude modulated signal by adjusting a modulation
3	index.
1	19. The method of claim 14 wherein the second RF signal comprises a
2	signal of form $\beta \sin(\omega_m t)$, wherein β is a modulation index and is less than or equal to 1,
3	$\omega_{\rm m}$ is the modulating frequency, and t is time.
1	20. The method of claim 14 wherein the amplitude modulated signal is
2	of the form $E_0[1+\beta\sin(\omega_m t)]\sin(\omega_c t)$ wherein β is a modulation index, ω_m is the
3	modulating frequency, ω_c is the modulation, E_o is an initial electric field, and t is time.
1	21. The method of claim 14 further comprising passing the amplitude
2	21. The method of claim 14 further comprising passing the amplitude modulated signal through an impedance matching network.
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1	22	2. The method of claim 14 wherein second RF signal is in the form of
2	a sine wave.	
1	23	3. A method of delivering radio frequency (RF) power to a plasma,
2	the method comp	· ·
3	ge	enerating a first RF signal at a carrier frequency;
4	ge	enerating a second RF signal at a modulation frequency;
5		rming a frequency modulated signal by modulating the first RF signal
6	with the second I	
7	ge	enerating a plasma within the plasma processing chamber using the
8	frequency modul	ated signal.
1	24	The method of claim 23 further comprising:
2	an	aplifying the frequency modulated signal to generate a frequency
3	modulated power	signal, and
4	wl	nerein generating a plasma comprises using the frequency modulated
5	power signal to g	enerate a plasma.
1	25	. The method of claim 23 wherein forming the frequency modulated
2	signal comprises:	1
3	for	rming a frequency and amplitude modulated signal by modulating the
4	first RF signal wi	th the second RF signal, and a third amplitude modulating signal.
1	26	. The method of claim 23 wherein the modulation frequency is less
2	than about 0.1 tin	nes the carrier frequency.
1	27	. The method of claim 23 wherein the frequency modulated power
2	signal is of the for	rm $E(\omega_c,t) = E_o[\exp(i\omega_c t)] \exp[i\beta \sin(\omega_m t)].$
1	28	The method of claim 23 wherein the carrier frequency is 13.56
2	MHz.	
1	29	The method of claim 23 further comprising passing the frequency
2	modulated signal	through an impedance matching network.

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1	30. The method of claim 23 wherein the second RF signal is in the
2	form of a sine wave.
1	31. A power system for a plasma processing apparatus, the power
2	system comprising:
3	a single carrier source adapted to generate a first RF signal at a carrier
4	frequency;
5	a modulation source adapted to generate a second RF signal at a
6	modulation frequency; and
7	a modulator adapted to modulate the first RF signal with the second RF
8	signal to form an amplitude modulated signal, wherein the amplitude modulated signal
9	contains peaks with amplitudes greater than or less than amplitudes of the peaks of the
10	first RF signal.
1	32. A power system for a plasma processing apparatus, the power
2	system comprising:
3	a carrier source adapted to generate a first RF signal at a carrier frequency;
4	a modulation source adapted to generate a second RF signal at a
5	modulation frequency; and
6	a modulator adapted to modulate the first RF signal with the second RF
7	signal to form a frequency modulated signal.
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